REMARKS

This Response is submitted in reply to the Office Action dated November 22, 2006. Claims 1-6, 8-9, 11-15 and 17-30, pending in the application, stand rejected as follows:

- Claims 1-6, 8, 11-12 and 25-30 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,224,263 to Saville et al.;
- Claims 13-15 under 35 U.S.C. § 103(a) as being unpatentable over Saville et al.; and
- Claims 9 and 17-24 under 35 U.S.C. § 103(a) as being unpatentable over Saville et al. in view of U.S. Patent No. 5,833,369 to Heshmat; and

Claims 1, 17 and 25 have been amended herein. Claims 3-6, 19-22 and 27-30 have been canceled herein. Claims 1-2, 8-9, 11-15, 17-18 and 23-26 remain for further consideration. The rejections are traversed and reconsideration is respectfully requested, particularly in view of the clarifying amendments to the claims.

Objection to the Drawings under 37 C.F.R. § 1.83(a)

In the Office Action dated November 22, 2006, the Examiner objected to the drawings under 37 C.F.R. § 1.83(a), stating that the drawings, as originally filed, fail to show every feature of the invention specified in the claims. In response, Applicant has canceled claims 3-6, 19-22 and 27-30, which were directed to subject matter identified in the Examiner's objection. Accordingly, Applicant submits that the Examiner's concerns with the drawings have been adequately addressed and Applicant respectfully requests the Examiner to withdraw the objection and accept the drawings.

Amendments to the Claims

Applicant has amended claims 1, 17 and 25 of the present application to emphasize the flatness of the thrust bearing plate for the claimed compliant foil thrust bearing (i.e., a flat thrust bearing plate). As noted in the specification, load capacity of a foil thrust bearing, and thus its operation, is dependent on the flatness of the bearing. (See, e.g., ¶¶ 6, 15 and 28). Specifically, as flatness is maximized, load capacity increases. Prior art bearings have had difficulty in maintaining the flatness of the bearing plate, especially as the size and diameter of the bearing increases. Usually, defects in the flatness of such prior art bearing plates are introduced during the manufacturing process such that the bearing plates are never flat to begin with. For example, many prior art bearing plates become warped or wavy during the manufacturing process. Some prior art bearing plates are intentionally warped, such as the thrust bearing disk disclosed in U.S. Patent Nos. 6,224,263 and 4,624,583 to Saville et al., discussed in more detail below. Even the slightest wave, defect or stepped configuration can compromise the load capacity of the bearing, which can decrease the bearing life due to increased foil wear. Accordingly, Applicant's invention is directed towards manufacturing a flat, or planar, bearing plate, and maintaining the flatness during operation by making the bearing plates more compliant through circumferentially arranging decoupled bearing segments about the thrust bearing plate. Prior to Applicant's invention, such subject matter was not taught or suggested, and other devices and designs were pursued.

Applicant submits that the amendments to the claims are fully supported by the subject matter in the application as originally filed, and thus, no new matter has been added by the amendments herein. For example, FIG. 1 illustrates a stacked foil thrust bearing assembly in cross-section, where flat thrust bearing plates are shown. Additionally, FIGS. 4 and 5 provide perspective views of the thrust bearing assembly illustrating the claimed invention, as amended. Further, the flatness of the plates for the thrust bearing assembly is emphasized in at least original Paragraph 28 of the application.

Applicant's Arguments with Respect to the Rejections

Rejection of Claims 1-6, 8, 11-12 and 25-30 under 35 U.S.C. § 102(b)

The Examiner has rejected claims 1-6, 8, 11-12 and 25-30 under 35 U.S.C. § 102(b) as being anticipated by Saville et al. To support a claim rejection under 35 U.S.C. § 102(b), a single prior art reference must disclose each and every element of the claim, arranged as in the claim. Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Co., 221 U.S.P.Q. 481, 485 (Fed. Cir. 1984) ("Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claim invention, arranged as in the claim.").

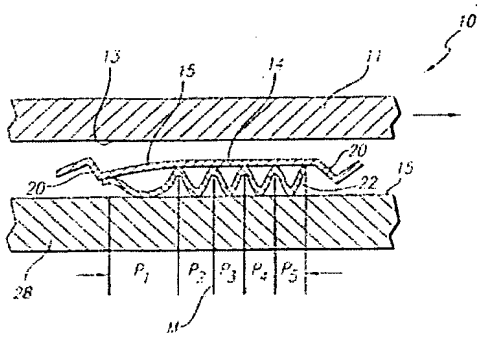
As amended herein, independent claims 1, 17 and 25 now clearly recite a flat thrust bearing plate that includes a plurality of decoupled bearing segments defined in part by a plurality of generally radially extending lines of weakness circumaxially dispersed about the thrust bearing plate, the decoupled bearing segments being circumferentially arranged about the thrust bearing plate. As noted in the specification, the decouplable aspect provided by lines of weakness permits the flatness of the thrust bearing plate to be maintained. (See Appl'n, ¶ 28).

U.S. Patent No. 6,224,263 to Saville et al. is directed to a "Foil Thrust Bearing with Varying Circumferential and Radial Stiffness". Specifically, a foil thrust bearing 10 comprises a thrust runner 11, a thrust bearing disk 14, an underspring element 22 and a thrust plate 28. (See, e.g., '263 patent, FIG. 1). The thrust bearing disk 14 is annularly shaped and comprises a plurality of integrated bearing pads or foils 16. The pads 16 are circumferentially positioned about the entire surface of the thrust bearing disk 14, and are alternately positioned with a plurality of slots 18. (See, e.g., '263 patent, FIG. 2, col. 3, ll. 9-22 & 29-32). The slots allow a substantially unrestricted flow of fluid to pass through the thrust bearing disk 14 to form a fluid film between the disk and the runner surface 13. (See '263 patent, col. 3, ll. 32-36). The slots are not provided to maintain flatness in the thrust bearing disk since the disk is not flat to begin with.

In the thrust bearing disk 14 disclosed by Saville et al., transition areas 20 are provided adjacent each slot 18. The transition areas 20 form a stepped configuration between adjacent pads 16, and thus, a stepped configuration over the entire thrust bearing disk 14. (See '263 patent, col. 3, ll. 43-46). This stepped

configuration is clearly seen in FIG. 4, reproduced herein below. Clearly, the thrust bearing disk 14 disclosed by Saville et al. is not flat or planar.

FIG. 4



The general design of the thrust bearing disk 14 relied upon by the Examiner reverts back to an earlier Saville patent, which is incorporated into the cited reference. (See '263 patent, col. 3, ll. 9-11 (referring to U.S. Patent No. 4,624,583 to Saville et al.)). The '583 patent illustrates several variations of an integral thrust bearing disk, including disks with slots, slits and perforations. In general, the slots define and separate sector-shaped portions of the disk that form a plurality of integral converging bearing pads or foils. (See '583 patent, FIG. 2). Indeed, the object of the Saville invention is described as providing a thrust bearing disk "with integral compliant bearing pads or foils thereby eliminating the need for a plurality of individual foils...." ('583 patent, col. 2, ll. 14-21). Thus, unlike the present invention, the foils are part of the thrust disk, as opposed to being disposed on the surface of the thrust bearing plate (cf., e.g., claim 1).

Moreover, because the focus of the Saville invention is to integrate the foils into the thrust bearing disk, the disk must be provided with transition areas between each sector, shown in the figures of the '583 patent as diverging surface ramps provided between each pad section, so that the compliancy of the foils is not affected by the rigidity of the disk. The ramps are radially aligned with the slots. Thus, the thrust bearing disk provides alternatively converging surface foils/pads and diverging surface ramps that form a waved cross-section. (See, e.g., '583 patent, FIGS. 3, 5, 7, 9 and 11; col. 3, ll. 5-7). This shape permits the foil portions to be compliant in accordance with the intended function of such bearing

foils while allowing the bearing disk to maintain requisite stiffness. (See, e.g., '583 patent, col. 1, ll. 13-26).

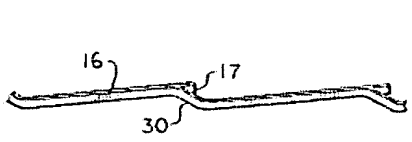


FIG. 3

FIG. 5

FIG. 7

FIG. 9

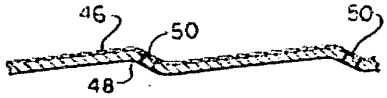


FIG. 11

Certainly, the thrust bearing disks disclosed by Saville et al. in either of their cited patents are not flat, as recited in the pending claims, as amended. The simplistic representations in the remaining Saville Figures do not trump the clear teachings provided by the cross-sectional views and the critical descriptions thereof in the Saville specifications. Indeed, every embodiment of a thrust bearing disk disclosed by Saville et al. includes the converging pads and the diverging ramps, and therefore the non-flat, non-planar disk design. (See, e.g., '583 patent, col. 4, ll. 18-28 (ramp height between 0.0005 to 0.010 inches with a range of 0.001 to 0.002 preferred)).

For at least the above-identified reasons, the Saville et al. references do not teach or suggest each and every element of the Applicant's claims 1, 17 and 25, as amended, and therefore cannot anticipate those claims. Accordingly, the rejection of amended independent claims 1 and 25 under 35 U.S.C. §102 (b) should be withdrawn.

Additionally, pending claims 2, 8, 11-12 and 26 depend either directly or indirectly from one of claims 1 and 25 and thereby incorporate all of the limitations of one of these claims and also recite additional limitations. Since, for at least the above-identified reasons, the Saville et al. references do not anticipate amended claims 1 and 25, dependent claims 2, 8, 11-12 and 26 are also deemed

not anticipated. Therefore, it is respectfully submitted that the rejection of those claims under 35 U.S.C. § 102(b) should also be withdrawn.

Rejection of Claims 13-15 under 35 U.S.C. § 103(a)

The Examiner has rejected claims 13-15 under 35 U.S.C. § 103(a) as being unpatentable over Saville et al. The Examiner acknowledges that Saville et al. do not disclose lines of weakness extending from the outer diameter, or both the inner and outer diameters, wherein the lines of weakness are circumaxially dispersed about the thrust bearing plate in sequenced manner. Nevertheless, the Examiner states that it would have been obvious to one of ordinary skill in the art to supply such features to the thrust bearing disk disclosed by Saville et al. without affecting the intended function of the disk.

As noted above, Saville et al. fail to disclose or suggest a flat thrust bearing plate with a plurality of foils disposed on the surface thereof. Instead, Saville et al. emphasize a thrust bearing disk with integrated, converging pads or foils that are separated by diverging ramps to form a stepped or waved profile. An obviousness rejection under Section 103(a) is only proper when the cited reference(s) teach or suggest each and every limitation of the claimed invention, with the requisite motivation, suggestion or teaching regarding the desirability of modifying the prior art to accommodate any changes. See Brown & Williamson Tobacco Corp. v. Philip Morris Inc., 229 F.3d 1120, 1124-25, 56 U.S.P.Q.2d 1456, 1459 (Fed. Cir. 2000). Moreover, the Examiner must look at the state of the art that existed at the time the invention was made and resist from relying on hindsight. See Sensonics, Inc. v. Aerosonic Corp., 81 F.3d 1566, 1570 (Fed. Cir. 1996).

Since there is no teaching or suggestion whereby a person of ordinary skill would have been led to modify the prior art design to incorporate the characteristics of the present invention, and in so doing, alter the structure and operation of the Saville et al. design (which clearly emphasizes the use of the alternately converging surface pads and diverging surface ramps ('583 patent, col. 3, ll. 1-7)), an obviousness rejection of the pending claims, as amended, is improper. Accordingly, Applicant submits that the Examiner's rejection of claims 13-15 under 35 U.S.C. § 103(a), is improper, and should be withdrawn.

Rejection of Claims 9 and 17-24 under 35 U.S.C. § 103(a)

The Examiner has rejected claims 9 and 17-24 under 35 U.S.C. § 103(a) as being unpatentable over Saville et al. in view of Heshmat. The Examiner acknowledges that Saville et al. do not disclose a spring plate having a plurality of decoupled bearing segments defined in part by generally radially extending lines of weakness, the decoupled bearing segments being circumferentially arranged about the spring plate. The Examiner asserts that Heshmat teaches such a spring plate, and that it would be obvious to one of ordinary skill in the art to incorporate the Heshmat spring plate with the Saville et al. thrust bearing disk.

As noted above, the Saville et al. references fail to disclose or suggest a flat thrust bearing plate with a plurality of foils disposed on the surface thereof. Instead, Saville et al. emphasize a thrust bearing disk with integrated, converging pads or foils that are separated by diverging ramps to form a stepped or waved profile. Thus, even the combination propounded by the Examiner fails to teach or suggest each and every limitation of Applicant's claimed invention, as amended. Accordingly, Applicant submits that the Examiner's rejection of claims 9, 17-18 and 23-24 under 35 U.S.C. § 103(a), is improper, and should be withdrawn.

Moreover, there is no motivation to utilize the design or components of the Saville et al. references in the device disclosed in Heshmat and vice versa. Specifically, there is no motivation to use the slits, slots or perforations disclosed in the Saville et al. thrust bearing disk in the flexible membrane disclosed in Heshmat. The flexible membrane 60 of Heshmat does not include a plurality of generally radially extending lines of weakness circumaxially dispersed about the membrane which define in part a plurality of decoupled bearing segments such that the decoupled bearing segments are circumferentially arranged about the membranes. Clearly, as shown in Figure 2 of the Heshmat reference, the flexible membrane 60 of Heshmat defines radially-spaced rows of circumferentially extending slots 74 that are not radially extending lines of weakness as set forth in Applicant's amended claims.

Further, the flexible membrane 60 fails to include decoupled bearing segments defined by lines of weakness. The segments generally correspond to top foils for operation of the thrust bearing. In Heshmat, any "segment" in the membrane 60 is defined by solid portions of the membrane 60, as shown in Figure

5 of Heshmat (essentially, foils are placed over and cover the slots). Slots 74 are positioned within the "segments". Thus, Heshmat discloses the opposite structure from Applicant's invention, as claimed (i.e., "a plurality of decoupled bearing segments defined in part by a plurality of generally radially extending lines of weakness"). To add any slots, slits or perforations, as disclosed by Saville et al., and certainly to include any diverging ramps and make the decoupled segments converging, would alter the design and intended operation of the flexible membrane 60 of Heshmat.

Conclusion

In view of the foregoing, it is respectfully submitted that claims 1-2, 8-9, 11-15, 17-18 and 23-26 as amended and presented herein are allowable. All issues raised by the Examiner having been addressed herein, an early action to that effect is earnestly solicited.

Applicant hereby petitions for a one-month extension of time in order to file this Response. The fee of $60.00 required under 37 C.F.R. § 1.17(a) is enclosed.

If any additional extension of time for the accompanying Response is required, Applicant requests that this Paper be considered a petition therefore.

If any other fees are due, authorization is hereby given to charge Deposit Account No. 13-0235.

By _____
Wm. Tucker Griffith
Registration No. 44,726
Attorney for Applicant

McCormick, Paulding & Huber, LLP
Attorney for Applicant
CityPlace II, 185 Asylum Street
Hartford, CT 06103-4102
Tel. (860) 549-5290